

*Excerpted from*

# Digital-Age Literacy for Teachers: Applying Technology Standards to Everyday Practice

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*Education is the only business still debating the usefulness of technology.  
—Former U.S. Secretary of Education Rod Paige*

Since the 1980s, developments in technology have significantly affected nearly every facet of life except life in the classroom. How many everyday technologies such as laptops, cell phones, digital cameras, and MP3 players are actually available to students and teachers in a meaningful context within the classroom? This lack of effective technology integration in education is attributable to a lack of a coherent vision for systemic reform. *Digital-Age Literacy for Teachers* helps both preservice and experienced teachers understand how technology use can improve instructional practice and increase student performance. The following excerpt discusses the digital divide that often exists between how teachers and students view and use technology and offers strategies for teachers to implement technology more effectively in the classroom.



## Chapter 2

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### STANDARD II

# Planning and Designing Learning Environments and Experiences

Teachers plan and design effective learning environments and experiences supported by technology.

#### PERFORMANCE INDICATORS FOR TEACHERS

- II.A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
  - II.B. Apply current research on teaching and learning with technology when planning learning environments and experiences.
  - II.C. Identify and locate technology resources and evaluate them for accuracy and suitability.
  - II.D. Plan for the management of technology resources within the context of learning activities.
  - II.E. Plan strategies to manage student learning in a technology-enhanced environment.
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## Chapter 2 Overview

I’ve always been a proponent of appropriate use of technology as a tool for teaching and learning as opposed to using technology for its own sake. I still hold this belief; however, we’ve reached a point where educators’ views of “best use” of technology and students’ perceptions of “best use” are diverging significantly. The PowerPoint presentation posted on the National Education Technology Plan Web site includes the following quote from former U.S. Secretary of Education Rod Paige: “Education is the only business still debating the usefulness of technology.”

Today’s teachers must come to grips with the fact that accomplishing tasks using more traditional methods may still work, but this often leaves students cold. Why? Because outside the classroom students have access to technologies that allow them to do the same work in ways that make more sense to them. Instead of clinging to the way you learned to do things as students, you need to embrace real-world uses of technology and at least mirror, if not lead, that use in the classroom.

Standards II through IV address how teachers plan (Standard II), implement (Standard III), and assess (Standard IV) technology-supported instruction. There’s a strong correlation among the performance indicators for these three standards. Read chapters 2, 3, and 4 carefully to identify the connections.

## Designing Technology-Enhanced Learning Environments and Experiences

	<b>Performance Indicator II.A.</b>
	Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
	<b>Performance Indicator II.B.</b>
	Apply current research on teaching and learning with technology when planning learning environments and experiences.

All five performance indicators for this standard are interdependent, but Performance Indicators II.A. and II.B. are particularly intertwined. Therefore, these two performance indicators are discussed together here.

To design learning opportunities that employ effective technology-enhanced instructional strategies, you must know what current research says about teaching and learning with technology. In addition, you must clearly understand how your personal views and use of technology influence your ability to use technology as a tool for teaching and learning. This is underscored in a report published by the SouthEast Initiatives Regional Technology

in Education Consortium (2001) titled *Lessons Learned: Factors Influencing the Effective Use of Technology for Teaching and Learning*.

One finding in the report states, “Effective use of technology requires changes in teaching; in turn, the adoption of a new teaching strategy can be a catalyst for technology integration.” In other words, teachers who are effective users of classroom technology have changed their approach to instruction and shifted to using technology as a learning tool.

This critical distinction is also found in the Apple Classrooms of Tomorrow Project (1995) research. This project ran from 1985 to 1995 and examined how teachers and students in target classrooms used technology over a period of time. One of the most important findings was that project teachers learned how to use technology in stages, and effective incorporation of technology as a tool for learning didn’t enter into the picture until the later stages. The stages identified in this research are shown in table 2.1.

TABLE 2.1 ■ Stages of educator learning

STAGE	BEHAVIORS
Entry	Teacher is learning the basics of a technology, e.g., how to set up equipment and operate it.
Adoption	Teacher begins to use the technology in management areas, e.g., computer-generated quizzes or worksheets, grade books.
Adaptation	Teacher begins to use software to support instruction, e.g., a commercially produced content area program or productivity tools (word processor, database).
Appropriation	Teacher begins to focus on collaborative, project-based technology use, and technology becomes one of several instructional tools.
Invention	Teacher begins to develop different uses for technology, e.g., creates projects that combine two or more technologies.

Source: Data adapted from Apple Classrooms of Tomorrow Project (1995).

Another significant factor is the growing recognition that the majority of adults over the age of 30 (teachers included) view most aspects of technology use quite differently than do people younger than 30. This is because they didn’t grow up as technology users. Prensky (2001, October) coined the term *digital immigrant* to describe people who first learned how to use technology as adults. He explains that learning to use technology in adulthood is similar to learning how to speak a new language at the same age. It’s still possible to become proficient in the language, but most adult learners will have at least a slight accent.

By the same token, digital immigrants can learn to use new technologies, but they often unconsciously limit this learning to automation of familiar tasks, ignoring other capabilities that would ultimately enable them to approach tasks in new or different ways. Prensky calls this a *digital accent*. Teachers who doubt the existence of digital accents need only think about the number of adults who print online articles before reading them.

Although it's not necessarily their intent, digital immigrants often limit students' use of technology even when access isn't an issue. Students may be required to write a rough draft by hand before being allowed to use a word processor. Or students may be provided laptops to take notes and then told to keep the lid closed during direct instruction so that the teacher can be sure they're paying attention. These are just two of many ways digital accents can impede classroom technology use. However, you can make effective use of technology as a tool for learning when you recognize your digital accents and adjust for them.

### Research on Effective Use of Technology as a Tool for Teaching and Learning

It's often said there isn't much research showing that technology use has any impact on teaching or student learning. That may have been true a decade ago, but today, it's simply not the case. Numerous studies examine the use of technology as a teaching and learning tool. The resources section at the end of the chapter has links to some of this research. Here's a summary of the major findings:

1. Teachers make more effective use of technology as an instructional tool when
  - technology use is systemically included in lesson and unit plans, providing information about the hardware and applications used and how this supports instructional objectives and students' learning needs;
  - they make sure students have acquired basic proficiency with the technology prior to using it in a content-based lesson;
  - the technology is used to extend or reinforce core curricula; and
  - school site plans describe in detail how technology is used to support curriculum, instruction, and administration.
2. There's a positive impact on academic performance when
  - student use of technology is supported by teachers, administrators, and parents;
  - technology use is integrated throughout the school day;
  - the application used has a direct correlation to the curriculum objectives being assessed;
  - the application adjusts the level of difficulty and provides feedback based on individual students' needs;
  - students have opportunities to work collaboratively while using the technology; and
  - students have opportunities to design and implement content-related projects.

Couple these findings with the information about teacher use of technology provided earlier in this chapter, and we begin to understand the multiple ways educators can use technology as a teaching and learning tool.

## Getting Started

The following table includes steps you might take to ensure you're planning for effective use of technology.

TABLE 2.2 ■ Planning for effective use of technology

STEP	EXAMPLE
1. Based on the site technology plan and curriculum objectives, consider whether technology use would be appropriate as a teaching tool.	<p>Technology performance indicator from site plan:</p> <p>Use technology tools for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom.</p> <p>English/language arts performance indicators:</p> <p>Create simple documents by using electronic media and employing organizational features (e.g., passwords, entry and pull-down menus, word searches, thesaurus, spelling checker).</p> <p>Edit and revise manuscripts to improve the meaning and focus of writing by adding, deleting, consolidating, clarifying, and rearranging words and sentences.</p>
2. Choose a familiar technology or a feature of an application that can be used to meet the objectives.	Editing features of a word processor (e.g., Track Changes, Cut, Copy, Paste, Spelling and Grammar)
3. Design a teaching activity.	Model use of editing features (e.g., Track Changes, Cut, Copy, Paste, Spelling and Grammar) during daily language exercises. Use teacher presentation station and word processor to project sentences students need to correct. After students have corrected sentences independently, brainstorm corrections using the editing features. Discuss all suggestions and accept or reject edits using Track Changes. Compile exercises into a file that's printed and distributed to students each week.
4. How does this activity demonstrate effective use of technology as a teaching tool?	Daily use becomes systemic and provides opportunities to model technology skills while addressing specific content area skills. Weekly printouts ensure that students have a common language reference for writing essays.
5. Can these same technology skills be used as a learning tool to extend or reinforce the curriculum objectives?	Students write a brief essay each week that incorporates skills covered in daily language exercises. Students dislike editing the essays. Reserve the mobile laptop lab twice each week so students can word process their essays and work individually or in small groups to edit one another's writing using the editing features modeled during daily language exercises. This meets the standards listed above.
6. Review student learning profiles and technology skills.	A few students prefer to do this kind of activity independently. The remaining students work well in trios. The trios can be heterogeneous so that students with stronger skills can assist others. (Intelligences: Verbal, Interpersonal, Intrapersonal.) All students know how to create a word processing document, enter text, and use the Cut, Copy, and Paste commands. Students need direct instruction in how to use Track Changes and Spelling and Grammar.
7. How does this activity demonstrate effective use of technology as a learning tool?	Use will become systemic. Students have an opportunity to use technology in a way that is directly related to curriculum objectives. As they work collaboratively, groups will decide how they want to approach the task of editing the files.

Using these steps may seem artificial at first. However, with practice it becomes easier to think in these terms while planning. When this occurs, use of technology-based tools becomes one of many strategies you regularly consider when designing lessons and learning activities.

Many resources offer ideas for technology-supported, content-based activities. For example, ISTE publishes a variety of journals and books that address this topic. Browse these materials by going to [www.iste.org](http://www.iste.org) and clicking on the Publications link. Other useful links are Internet4Classrooms' Integrated Technology Lesson Plans ([www.Internet4classrooms.com/integ\\_tech\\_lessons.htm](http://www.Internet4classrooms.com/integ_tech_lessons.htm)), AT&T Knowledge Network Explorer's Blue Web'N ([www.filamentality.com/wired/blueWebn/](http://www.filamentality.com/wired/blueWebn/)), and TrackStar (<http://trackstar.4teachers.org/trackstar/>).

The following table provides steps you might take to increase your ability to design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support learners' diverse needs. The table also has steps for using current research on teaching and learning with technology when planning learning environments and experiences.

TABLE 2.3 ■ Performance Indicators II.A. and II.B.

II.A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

II.B. Apply current research on teaching and learning with technology when planning learning environments and experiences.

**Directions:** Rate each numbered statement using the scale provided. Use the short-answer areas to respond to prompts or questions.

Rating Scale:					
1 = Never   2 = Seldom   3 = Sometimes   4 = Often   5 = Regularly (as appropriate)					
1. Current research on teaching and learning with technology is considered when planning learning environments and experiences.	1	2	3	4	5
Describe how current research on teaching and learning with technology is considered when planning learning environments and experiences:					
List two useful resources for current research on teaching and learning with technology:					
How could you increase or improve the use of research in planning? List at least two action steps you will take:					

(Continued)



TABLE 2.3 ■ Performance Indicators II.A. and II.B. (Continued)

2. Appropriate technology-supported teaching strategies are incorporated into lessons to enhance instruction.	1	2	3	4	5
Describe how appropriate technology-supported teaching strategies are incorporated into lessons to enhance instruction:					
List 2–3 steps you will take to increase or improve incorporation of appropriate technology-supported teaching strategies into lessons to enhance instruction:					
3. Developmentally appropriate technology-supported learning strategies are incorporated into lesson plans to support the diverse needs of learners.	1	2	3	4	5
Describe how developmentally appropriate technology-enhanced learning strategies are incorporated into lesson plans to support the diverse needs of learners:					
List 2–3 steps you will take to increase or improve the incorporation of developmentally appropriate technology-supported learning strategies into lesson plans to support the diverse needs of learners:					

## Locating and Evaluating Technology Resources

### Performance Indicator II.C.

Identify and locate technology resources and evaluate them for accuracy and suitability.

Reading product reviews, visiting vendors in the exhibit hall during conferences, and soliciting recommendations from colleagues are just a few ways to stay current on available technology resources. Online publications such as *techLEARNING* (<http://techlearning.com>), *Learning & Leading with Technology* ([www.iste.org](http://www.iste.org), click on Publications), *T.H.E. Journal* ([www.thejournal.com](http://www.thejournal.com)), and *eSchool News* (<http://eschoolnews.com>) regularly offer product reviews and information in print and online. Web sites, including EvaluTech ([www.evalutech.sreb.org](http://www.evalutech.sreb.org)) and the California Learning Resource Network ([www.clrn.org](http://www.clrn.org)), are also helpful. However, don't rely solely on the opinions of others.

The best way to evaluate a new technology is to try it out in the environment where it will be used. Many software publishers now offer demo programs that can be downloaded and reviewed for 30 days. Others allow potential customers to order a software package or piece of equipment on a 30-day trial basis. Ask the principal and tech support staff if it's permissible for teachers to use either of these options when reviewing new products. If not, find out what other options are available.

It's helpful to use a software review form when evaluating a new program because the items included provide a checklist that helps ensure a thorough review. Also, notes taken during the evaluation help jog the reviewer's memory when, after reviewing several items, it's time to make a choice. Completed reviews then become resources for subsequent use by other reviewers and help answer questions about why something was (or wasn't) selected.

Districts sometimes develop their own evaluation forms, but if you don't have access to a district form, you can easily find sample forms online. For example, the Educational Software Evaluation Form developed by ISTE is available at [http://cnets.iste.org/teachers/pdf/App\\_D\\_Software.pdf](http://cnets.iste.org/teachers/pdf/App_D_Software.pdf).

Kathy Schrock's Software Evaluation Form at <http://kathyschrock.net/1computer/page4.htm> is also a good tool for this purpose.

Hardware review is another matter altogether. As district and site networks expand in size and complexity, security and compatibility issues increase as well. Districts often establish minimum specification standards, but so many variables must be taken into account that it's usually best to work with both instructional and tech support staff when evaluating new hardware. Why both? Because decisions about adoptions of new hardware must be based on what's instructionally sound and technically practical. Engaging representatives from both arenas at the outset can save time and help ensure sound decisions.

You also need to become skilled at locating and evaluating online resources. Online search engines are easier to use today than ever before, but there are tips and tricks that help target searches more effectively. To learn more about the capabilities of a particular search engine, go to its home page and look for a link called Help, Advanced Search Techniques, or something similar. For example, Google's home page has an Advanced Search link so that users can refine searches to include specific file formats, publication dates, or languages, and more. Scroll to the bottom of the home page and click on Help to find an index of short articles that answer frequently asked questions (FAQs).

### Web-Based Bookmarking Services

Most computer users know how to use their Web browser's Favorites or Bookmarking command to save a Web site in the computer's desktop. While this is a handy feature, access to the list of sites saved is restricted to the individual computer. Free Web-based bookmarking services such as Backflip.com ([www.backflip.com](http://www.backflip.com)) enable you to access bookmarked sites from any Internet-connected computer. Several of these services, including del.icio.us (<http://del.icio.us/>) even allow you to share your bookmark lists with others.

This means you can easily share sites with colleagues and students. A Google search using the keywords "Web-based bookmarking" yields a lengthy list of services to choose from. To get started, subscribe to an account and follow the directions provided by that service.

Online resources range from full courses, to individual Web sites with information that supports curricular concepts, to supplemental materials and e-books posted by textbook publishers. Some of these materials are free, while others are fee-based. Once resources are located, it's important to take the time to review them carefully. Virtually anyone who has the skills and access can post information online, regardless of their level of expertise or credentials, so it's best to have a critical eye. Unlike hard-copy publications, where even physical appearance can provide clues about the reliability of the information (think tabloid compared to a copy of the *New York Times*), Web site design is not necessarily indicative of content quality. There are many hoax Web sites on the Web today. Some are fairly obvious, such as Save the Pacific Northwest Tree Octopus (<http://zapatopi.net/treeoctopus/>) or Fun Phone ([www.funphone.com/old/](http://www.funphone.com/old/)). But others, such as Dihydrogen Monoxide Research Division ([www.dhmo.org](http://www.dhmo.org)) and Fakes and Originals ([www.saskschools.ca/~ischool/tisdale/integrated/wysiwyg/assignment\\_1.htm](http://www.saskschools.ca/~ischool/tisdale/integrated/wysiwyg/assignment_1.htm)), take more time to identify.

You should consider several elements when evaluating online resources. Table 2.4 provides a list of evaluation criteria.

The Web offers many sample online-resource review tools. For example, Kathy Schrock's Guide for Educators includes the Critical Evaluation Information page at <http://school.discovery.com/schrockguide/eval.html>. It features rubrics and articles related to Web site evaluation.

TABLE 2.4 ■ Suggested Web site evaluation criteria

QUESTIONS TO ASK		WHAT TO LOOK FOR
<b>Source</b>	<p>Was the material prepared by a reliable person or organization?</p> <p>How do you know?</p> <p>Is contact information provided?</p>	<p>The URL will reveal if this is a personal site or one hosted by an education, government, nonprofit, or commercial entity.</p> <p>The name of the author or organization should appear on the home page.</p> <p>An About Us link should provide additional background information.</p> <p>A Contact Us link should provide at least an e-mail address and telephone number.</p>
<b>Material</b>	<p>Is the information that's presented original, or is it a collection of links?</p> <p>Is the information current?</p> <p>Are resources clearly cited?</p> <p>How accurate is the material?</p>	<p>Look for reliable outside links. Multiple broken or weak links detract from the reliability of the original site.</p> <p>Each page (usually at the bottom) should have a Last Updated notation.</p> <p>Look for footnotes, bibliographies, or links that provide supporting documentation.</p> <p>Examine additional online and offline sources to verify material.</p>
<b>Site design</b>	<p>Is the site easy to navigate?</p> <p>Can useful information be retrieved quickly?</p> <p>Do visuals enhance or detract?</p>	<p>Links to other pages in the site should be easy to see and clearly identified.</p> <p>As a rule, you should be able get what you need in 3–4 clicks.</p> <p>Pages should be visually attractive but not cluttered.</p> <p>The number of graphics should not noticeably impact the time it takes for pages to load for viewing.</p>
<b>Access</b>	<p>Is the site free or fee-based?</p> <p>Have accommodations been made for users with physical or learning disabilities?</p>	<p>Double-check that subscription information is linked to the home page; it generally is.</p> <p>Examine the Terms of Use to determine if you want to sign up for an account.</p> <p>Look for a notice stating Bobby or WebXACT approval (indicates the site has been checked for accessibility).</p> <p>Watch for items that may impact users with disabilities, including font size, color scheme, page layout, auditory content, etc.</p>
<b>Advertising</b>	<p>Is the site ad-free?</p>	<p>Take notice of advertising. Students are easily influenced by ads, and some districts prohibit use of Web sites that include ads. If sites with ads are permissible, make sure the ad content is appropriate for students.</p>

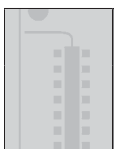
It's important to remember that many online teaching resources, particularly lesson plans, have little or nothing to do with effective use of technology. This means that if you're looking specifically for lessons that model effective technology use, you may need to sift through a number of lesson plans before finding good materials. Plan ahead and develop a plan for book-marking promising lessons for later retrieval. Lesson plan sites referenced earlier in the chapter are also appropriate resources to explore when implementing this performance indicator.

Use the questions in table 2.5 to consider steps that might be taken to increase your ability to identify and locate technology resources and evaluate them for accuracy and suitability.

**TABLE 2.5 ■ Performance Indicator II.C.**  
Identify and locate technology resources and evaluate them for accuracy and suitability.  
**Directions:** Give a Yes or No answer to questions 1 and 2. Use the short-answer areas to elaborate on your answers.

1. Does the district have policies for software, hardware, and online resource reviews?	Yes	No
If your answer is Yes, describe your district's policies for software, hardware, and online resource reviews:		
Do these policies help or hinder teachers? Explain:		
2. Does the district provide forms for evaluating software, hardware, and online resources?	Yes	No
If your answer is Yes, describe how these forms are used:		
What kind of support do teachers need to effectively evaluate new technology resources? Explain:		

## Planning Lessons That Make Effective Use of Learning Technologies



### Performance Indicator II.D.

Plan for the management of technology resources within the context of learning activities.

If you're not an experienced technology user, or aren't confident in your troubleshooting skills, you'll need to take more time initially to plan lessons that incorporate the use of technology resources. In addition to thinking about how the content will be addressed, you'll need to plan for the mechanics of dealing with equipment and software or other instructional materials. However, this need to take extra time will diminish as your level of technology proficiency grows.

If you use reflective journaling to document your implementation of new lessons, you'll find that it's easier to return to the lesson at a later date and remember what you did, what worked well, and what needed revision before presenting the lesson again. When planning how you'll manage technology resources within the context of learning activities, you'll need to consider several factors in several areas.

### Hardware

Once you've identified a lesson where use of technology would enhance or enrich the content, it's time to ask several practical questions about the equipment needed:

1. What technology will be used?
2. Is the technology available on-site, or will it need to be borrowed or checked out from another location?
3. Is the technology available when needed?
4. Where will the technology be used?
5. How will this location limit or enable use of this technology?

These questions are important because they'll help you think through the basics and avoid making assumptions. Start with a list of what's needed. If the technology is available in the classroom, it should be easy to answer the remaining questions. However, if the equipment must be borrowed or used in a lab, don't assume that a piece of equipment will necessarily be available. Things break, disappear, or are scheduled for use elsewhere. Be sure to check on availability and scheduling requirements well ahead of time.

Think through how you plan to use the technology and how your location might impact this use. For example, bringing a mobile lab of laptops or handheld computers into the classroom provides more flexibility in where and how the equipment is used, but this may also mean that you'll have to ensure that batteries have been charged before the lesson. If you want to use the Internet, it might be necessary to use a lab, depending on what kind of online access is available and the quality of the connection. Time may also be a factor, particularly if students must leave the classroom and boot up equipment before they can actually get started on the lesson. This is an especially important consideration for teachers on a 50- or 60-minute class schedule.

Another issue may be the arrangement of the physical space where students will be working. Is the layout conducive to a variety of instructional groupings, or are options limited? Is the teaching station in a convenient location where it's easy to observe students at work, or is it difficult to move around the room to monitor progress? None of these issues are insurmountable, but they do need to be considered before teaching the lesson.

If the space isn't ideal due to furniture arrangement, you can temporarily move desks, tables, and chairs to achieve desired learning groupings and flow of traffic. Structural issues such as lines of sight obstructed by support pillars (often found in large labs or media centers) are more difficult to control, but preplanning still helps. If possible, either steer students away from workstations with poor sightlines or structure activities so that students don't need to constantly direct their attention toward the front of the room.

### Instructional Materials (Software and Online Resources)

In addition to thinking about hardware, it's important to take the time to make plans about the software and online resources required. Here are several questions to consider:

1. What technology-based instructional materials will be used?
2. Are the materials to be used compatible with the available hardware?
3. If software is included in the plan, is it installed on every computing device?
4. If online resources are included in the plan, how will students be accessing this information (e.g., using bookmarks, hotlists, search engines, etc.)?
5. If online resources are included in the plan, have URLs been checked for accuracy and availability?

Again, don't make assumptions. Once you've selected the materials, make sure they're available and working. Newer software doesn't always run on older computers. Schools sometimes have multiple versions of software programs, which may lead to confusion in the classroom, especially if one student's screen looks different from a neighbor's but both are engaged in the same activity.



Also, schools don't always purchase enough licenses to have every program installed on every machine. Teachers need to check licensing restrictions before installing programs on new or additional machines. You may also need to work with technical support staff to acquire software installation rights on the network if they're not available to do the install themselves.

When using online resources, make certain they're accessible at school. That wonderful site you found on your home computer may be blocked by the district filter, or the online lesson that worked well last year may flop today because the link is no longer available. Bookmark specific sites or create a hotlist so that students aren't wasting time typing and retyping Internet addresses to access sites. Online tools such as Filamentality and TrackStar (see the resources section at the end of the chapter) are easy to use, and they enable teachers to create Web-based activities with links built right in.



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**FIGURE 2.1** Using Web-based Filamentality templates, you can easily create a variety of online activities with embedded links for student use.

## Troubleshooting

No matter how much preplanning is done, there's always the chance that something will go wrong. What happens when a piece of equipment doesn't work, when the network goes down, or when the software locks up? When using a new piece of equipment or a new program, it's worth taking time to meet with technical support staff to review how to use the technology and learn simple troubleshooting techniques. Many of these skills are transferable, so once you've learned how to handle a situation with one piece of equipment or program, the same troubleshooting skills will often work in other circumstances.

Think about how to handle the immediate situation first and then troubleshoot later to make sure the problem doesn't happen again. Learn your district's or site's procedures for getting assistance, and follow those procedures.



Always have a backup plan. Yes, the goal is to use technology to engage students and use information in new, inventive ways; and this should mean that your lessons become increasingly technology-immersed. However, remember when the film didn't get delivered or a torrential rain meant scrapping an outdoor activity? When these things happen, teachers don't decide to abandon showing films or confine all lessons to indoor environments. It's the same with technology use. As your level of confidence with technology grows, your ability to make adjustments in technology use will also increase. Students understand and respect a teacher's willingness to try, even when something goes wrong.

Use the following table to consider steps that might be taken to increase your ability to plan for the management of technology resources within the context of learning activities.

**TABLE 2.6 ■ Performance Indicator II.D.**

Plan for the management of technology resources within the context of learning activities.

**Directions:** Rate each numbered statement using the scale provided. Use the short-answer areas to respond to prompts or questions.

Rating Scale:					
1 = Never   2 = Seldom   3 = Sometimes   4 = Often   5 = Regularly (as appropriate)					
1. I specifically plan for the management of hardware use within the context of learning activities.	1	2	3	4	5
Management strategies for hardware use within the context of learning activities include:					
List 2–3 steps you'll take to increase or improve planning for the management of hardware use within the context of learning activities:					
2. I specifically plan for the management of technology-based instructional materials within the context of learning activities.	1	2	3	4	5
Management strategies employed for the use of technology-based instructional materials within the context of learning activities include:					

*(Continued)*

TABLE 2.6 ■ Performance Indicator II.D. (Continued)

List 2–3 steps you'll take to increase or improve planning for the management of technology-based instructional materials within the context of learning activities:					
3. I specifically plan for ways to troubleshoot problems when using technology resources within the context of learning activities.	1	2	3	4	5
Troubleshooting strategies employed include:					
List 2–3 steps you'll take to increase or improve planning strategies to troubleshoot problems when using technology resources within the context of learning activities:					

## Improving Student Learning with Technology

### Performance Indicator II.E.

Plan strategies to manage student learning in a technology-enhanced environment.

This is where many teachers become stymied. Refer back to the Apple Classrooms of Tomorrow (ACOT) study mentioned earlier in this chapter in the discussion of Performance Indicators II.A. and II.B. Typically, when teachers begin to use technology as a tool for instruction, they first use the technology for task management and then explore ways to automate traditional lessons. The same thing happens when teachers begin using technology as a learning tool for students. The natural inclination is to automate lesson activities. Students aren't asked to approach subject matter in a different way; rather, they're asked to use technology to do the same things, just a little faster.

For example, students will be asked to use a word processor to type a final copy of an essay instead of copying it by hand. Or, they're told to use a five-slide PowerPoint template instead of making a display board for a science fair project. Drill and practice software is used in lieu of flashcards and worksheets to review discrete skills in reading or math. While these automated activities may engage some students (at least initially), we cannot attribute any changes in overall student performance to this kind of technology use because the learning process itself hasn't changed.

The ACOT findings show that technology use does have an impact on student learning when it reaches the appropriation and invention stages. This doesn't mean you should avoid all adoption- and adaptation-stage activities, but it does mean you need to understand clearly what you're trying to accomplish instructionally, as well as how technology use at that level supports those goals.

Districts that accept Title II, Part D, of No Child Behind are required to measure students' levels of technology proficiency in eighth grade. These districts must also document how technology use is incorporated throughout the curriculum. The impact of these requirements filters down to the classroom. You may be asked to maintain profiles of students' skill levels in using technology and document use of research-based, technology-supported instruction. These requirements align well with the stages of use identified in ACOT, as well as with the spirit of this performance indicator.

### Student Technology Skills

While students may in general be more adept than their teachers at using various technologies, they're often self-taught and have gaps in what they can and cannot do. It's important to assess your students' general technology skills to know where direct instruction in hardware, software, or technology-based instructional materials will be necessary before students will be able to use the technology as a tool for learning. In these cases, lessons need to include activities at the adoption stage to get students up to speed on the technology. Is

this a waste of time? Not at all; many districts have created or adopted a scope and sequence of technology skills for students. Here are links to two examples:

- Kent School District's Technology Learning Outcomes—  
[www.kent.k12.wa.us/curriculum/tech/student\\_standards/k12chart.html](http://www.kent.k12.wa.us/curriculum/tech/student_standards/k12chart.html)
- Learning Point Associates' Student Technology Literacy Proficiency Checklist—  
[www.aea8.k12.ia.us/documents/u\\_031404213821.pdf](http://www.aea8.k12.ia.us/documents/u_031404213821.pdf)

These skills must be taught at some point, and it makes sense to teach them when meaningful content-based lessons immediately follow the skill instruction. Once students have acquired new technical skills, they'll be able to use these skills again and again. The first step in managing student learning in a technology-enhanced environment, then, is making sure students have mastered the basic skills.

## Troubleshooting Routines

Even after direct skills instruction, some students will need additional assistance using the technology. How can this be accommodated?

Just as routines are established for answering questions and providing assistance in other classroom activities, they must also be established for technology-supported lessons. Establish a sequence of steps for students to take when they need help. The first step may be for students to try to solve the problem on their own, using teacher-created step sheets that include screenshots and simple written directions. Step sheets can be created for virtually any program or Web site. Several sample step sheets for Microsoft Office programs may be downloaded at [www.portical.org/tools/msoffice2000\\_stepsheets.html](http://www.portical.org/tools/msoffice2000_stepsheets.html). The second step may be to ask a neighbor for assistance, using the step sheet. The third step may be to ask a designated student expert among a handful of students who are proficient in the skills and willing to help their peers.

If these steps don't correct the problem, the final step may be to ask an adult for assistance. Post these steps in the classroom along with a list of basic troubleshooting tips, and then encourage students to develop self-sufficiency by using them.

## Technology as a Learning Tool

Once students have learned the prerequisite technology skills, they can engage in activities using technology to enhance or expand their learning. Refer again to the ACOT stages of use in table 2.1. Begin by developing activities where students are working at the adaptation stage. This allows you to introduce and explore academic content, and it offers students additional practice in using the technology. You can introduce concepts using a teaching station, then ask students to engage in technology-supported guided activities.

At this point, all of your students will likely be engaged in the same or similar activities at the same time. How will this be managed? Will all students use the technology as part of a large group activity, or will students rotate through learning centers where technology use

is just one of several activities over a period of time? Will students have opportunities to use the technology individually?

In addition to the troubleshooting routines established during adoption-stage activities, you should institute procedures for completing and turning in work on time. Because initial activities will most likely be automations of fairly traditional lessons, regular classroom procedures may apply. However, it's important to review those procedures with regard to how students will document completed work. Who will they go to with content-related questions? How will you monitor students as they work? What is the backup plan?

Today, most teachers limit student use of technology as a learning tool to the adaptation stage. Unfortunately, research has shown that use of technology at this level has little or no impact on student performance. To learn effectively with technology, students must have opportunities to work at the appropriation and invention stages, engaging in projects that demonstrate content knowledge and mastery of technology skills. To be successful at this, students and teachers must first have basic technology skills and some confidence in their ability to solve technological problems.

When working at the appropriation stage, technology becomes one of several learning tools students use collaboratively to complete a project. Students typically work in cooperative groups, and each group may be using a different technology to complete a task. To accomplish this, you must be confident that your students have the technological and academic skills to work independently.

At the invention stage, students begin to identify new or different ways to use one or more technologies to solve problems. You may pose a question or problem and ask students to decide how they'll approach the task at hand, leaving it up to them to choose from a variety of work groupings, technologies, and learning resources. At this point you truly become a facilitator, providing support rather than direct instruction.

Management routines require careful thought at these last two levels. How will groups be formed? What are each member's responsibilities? How will work be documented and evaluated? How will you monitor multiple groups working on different activities? Activities of this scope tend to be long-term projects, extending over a quarter, a semester, perhaps even the entire year.

Use the questions in the following table to consider steps that might be taken to increase your ability to plan strategies to manage student learning in a technology-enhanced environment.

TABLE 2.7 ■ Performance Indicator II.E.  
Plan strategies to manage student learning in a technology-enhanced environment.

Directions: Give Yes or No answers to questions 1 and 2, and use the short-answer areas to respond to prompts for question 2. Use the short-answer areas to respond to prompts 3–6.

1. Has the district adopted a scope and sequence of technology skills for students?	Yes	No
2. Are teachers required to maintain profiles for individual students' levels of technology skills?	Yes	No
If profiles exist, explain how they are used to inform instruction:		
If profiles do not exist, explain how teachers assess student technology skills and use this information to inform instruction:		
3. List the three most commonly used technology-supported learning activities used in your classroom. Identify the ACOT stage for each activity listed:		
4. Describe troubleshooting strategies you and your students use when engaged in technology-supported learning activities:		
5. Describe your classroom management plan for handling technology-supported learning activities:		
6. List 2–3 action steps that you will take to increase or enhance your ability to manage student learning in a technology-enhanced environment:		

## Action Plan

Now that you've read about each performance indicator for Standard II and have had the opportunity to think about your level of implementation for each indicator, it's time to develop an action plan to improve or expand your professional practice in this area.

First, review your responses to the statements and questions in each performance indicator table. It's not possible to master every performance indicator at once, so choose one at a time. Build your plan by using the steps you identified you might take for the chosen performance indicator and complete your action plan by using the table below. Performance Indicator II.A. has been used as a sample.

**TABLE 2.8 ■ Teachers plan and design effective learning environments and experiences supported by technology**

Performance Indicator	Next Steps	I need to work on this step with the following people...	I will know this step has been achieved when...	Timeline
<i>II.A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.</i>	<i>Use table 2.2 in this chapter to modify an existing instructional unit to include adaptation-stage technology use.</i>	<i>District technology instructional specialist, site library/media specialist, other teachers at my grade level.</i>	<i>The modified instructional unit is ready for use with students.</i>	<i>2 weeks</i>
	1.			
	2.			
	3.			



## Resources

### ARTICLES AND REPORTS

Apple Classrooms of Tomorrow Project. (1995). *ACOT's 10 Year Report*. [Online report]. Available: [www.apple.com/education/k12/leadership/acot/library.html](http://www.apple.com/education/k12/leadership/acot/library.html)

National Education Technology Plan. (2005). [Online report]. Available: [www.ed.gov/about/offices/list/os/technology/plan/2004/site/edlite-default.html](http://www.ed.gov/about/offices/list/os/technology/plan/2004/site/edlite-default.html)

Prensky, Marc. (2001, October). *Digital natives, digital immigrants*. [Online article]. Available: [www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf](http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf)

SouthEast Initiatives Regional Technology in Education Consortium. (2001). *Lessons learned: Factors influencing the effective use of technology for teaching and learning*. [Online report]. Available: [www.seirtec.org/publications/lessons.pdf](http://www.seirtec.org/publications/lessons.pdf)

### ONLINE PUBLICATIONS

*eSchool News*. Available: <http://eschoolnews.com>

*Learning & Leading with Technology*. Available: [www.iste.org/LL/](http://www.iste.org/LL/)

*T.H.E. Journal*. Available: [www.thejournal.com](http://www.thejournal.com)

*techLEARNING*. Available: <http://techlearning.com>

### PRODUCT REVIEWS AND EVALUATION FORMS

California Learning Resource Network. Available: [www.clrn.org](http://www.clrn.org)

EvalUTech. Available: [www.evalutech.sreb.org](http://www.evalutech.sreb.org)

International Society for Technology in Education, *Educational Software Evaluation Form*. Available: [http://cnets.iste.org/teachers/pdf/App\\_D\\_Software.pdf](http://cnets.iste.org/teachers/pdf/App_D_Software.pdf)

Schrock, K. *Critical Evaluation Information*. Available: <http://school.discovery.com/schrockguide/eval.html>

Schrock, K. *Software Evaluation Form*. Available: <http://kathyschrock.net/1computer/page4.htm>

### RESEARCH SITES

International Society for Technology in Education (ISTE), *Center for Applied Research in Educational Technology*. Available: <http://caret.iste.org>

North Central Regional Educational Laboratory (NCREL). Available: [www.ncrel.org](http://www.ncrel.org)

PBS TeacherSource, *Technology & Teaching*. Available: [www.pbs.org/teachersource/teachtech/research.shtm](http://www.pbs.org/teachersource/teachtech/research.shtm)

U.S. Department of Education, Office of Educational Technology, *Evaluation and Research*. Available: [www.ed.gov/about/offices/list/os/technology/evaluation.html](http://www.ed.gov/about/offices/list/os/technology/evaluation.html)

## ONLINE TOOLS AND LESSONS

AT& T Knowledge Network Explorer's Blue Web'N.

Available: [www.filamentality.com/wired/blueWebn/](http://www.filamentality.com/wired/blueWebn/)

AT& T Knowledge Network Explorer's Filamentality.

Available: [www.filamentality.com/wired/fil/](http://www.filamentality.com/wired/fil/)

International Society for Technology in Education. Available: [www.iste.org](http://www.iste.org)

Internet4Classrooms, Integrated Technology Lesson Plans.

Available: [www.Internet4classrooms.com/integ\\_tech\\_lessons.htm](http://www.Internet4classrooms.com/integ_tech_lessons.htm)

University of Kansas, TrackStar.

Available: <http://trackstar.4teachers.org/trackstar/>

## SAMPLE STEP SHEETS

York, C., *Microsoft Office 2000 Step Sheets*.

Available: [www.portical.org/tools/msoffice2000\\_stepsheets.html](http://www.portical.org/tools/msoffice2000_stepsheets.html)

Without systemic reform, teachers cannot be expected to incorporate technology effectively in the classroom. *Digital-Age Literacy for Teachers* provides step-by-step plans to make technology integration happen. Order now by phone, by fax, or online. Single copy price is \$39.95. ISTE member price is \$35.95. Special bulk pricing is available. Call 1.800.336.5191 or go to **[www.iste.org/bookstore/](http://www.iste.org/bookstore/)**.